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Ultra-sensitive diagnostic device for the characterization of electron beams

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The demand for femto-Coulomb charge electron beams is vital for, e.g., accelerator research and development studies, tests of novel acceleration techniques, medical imaging, and ultra fast electron diffraction. This drives the need for equally sensitive beam diagnostics and instrumentation. To address this need, we present the development of a diagnostic device based on silicon strip sensors that is able to measure the profile, time structure, and charge of femto-Coulomb beams with low charge density. Its operability has been demonstrated in a wide range of beam intensities reaching from single electron detection up to 700 fC charge for the beam profile characterization and from 14 fC to 2.5 pC for the beam charge measurement. The device thereby demonstrates the applicability of silicon sensors as versatile beam instrumentation devices and can extend the capabilities of existing diagnostic devices to a new charge range.

Footnotes

Funding Agency

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Yes

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